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shown fig. 5), containing the belts and cartouch-boxes, and a case at each corner for spare cartouches. The lids *e* and *f*, seen in the other figures, lift up to get at the belts and cartouches, and the flaps *g* and *h* to get at the musquets.

N° V.

APPARATUS FOR FRACTURES OF THE
LOWER LIMBS.

The GOLD VULCAN MEDAL was this Session presented to JOSEPH AMESBURY, Esq. M. R. C. S. of Great Surrey-street, Blackfriars, for AN APPARATUS TO BE APPLIED IN CASES OF FRACTURE OF THE LOWER LIMBS. The following Communication has been received from Mr. Amesbury on the subject, and a set of the Apparatus has been placed in the Society's Repository.

82, Great Surrey-street,
SIR; Blackfriar's-road.

ALLOW me to request you to lay before your Society the accompanying apparatus which I have contrived for the treatment of fractures, both simple and compound, of the lower limbs; and also for the treatment of dislocations of the ankle and injuries of the knee: and to make the Society acquainted with the contents of the paper which you will receive with this communication, as far as they may tend to elucidate the

effects of the apparatus and show its advantages over the various splints and machines in common use.

I am, Sir,

To A. Aikin, Esq.

&c. &c. &c.

Sec., &c. &c.

J. AMESBURY.

Fractures and dislocations are regarded to be accidents of considerable importance both by the profession and the public. In the opinion of the profession, they are placed high in the scale of those injuries which stand in need of surgical assistance. The public believe a fracture to be a case of great moment; perhaps because they know that the patient usually suffers much pain in the injured part, and is under the necessity of submitting to considerable confinement; or, it may be, from the knowledge that the bones sometimes cannot be made to unite; and that they sometimes unite in such a manner as to leave the patient the subject of lameness, and of incurable deformity for the remainder of his life. Daily observation is sufficient to convince us of the manifold evils which accrue to society from the improper union of fractures. Much has been said upon this subject by men of great natural talent and professional acquirements, but though their observations have added considerably to our knowledge in this department of surgical science, I am disposed to think that they have left much for their successors to accomplish.

Feeling convinced of the imperfection of the plans which are commonly resorted to in the treatment of fractures of the lower extremities, I have been led to adopt a practice which I believe will be found to differ materially from any that has been hitherto pursued. The plan of treatment to which I allude, has for its object the prevention of deformity and non-

union ; and also to add to the comforts of the patient during the period necessarily required for the union of the bones. It consists principally in the employment of a new apparatus which is calculated to secure the fractured parts in their natural position, and to prevent them from moving upon each other. The degree of perfection to which I have now brought the apparatus that I employ in the treatment of those accidents, enables me to lay it before the members of the Society of Arts, with a hope that its utility will be found sufficiently supported to bear their fullest investigation.

In order, however, that the unprofessional members of the Society may be enabled to form some notion of the effects of the apparatus which I do myself the honour to submit to their inspection, it is proper that they should be made acquainted with the leading indications which we have to attend to in the mechanical treatment of those injuries for which the instrument was designed.

The motions of the trunk and limbs are performed by the action of the muscles upon the bones, which form the support or frame-work of the body. The action of the muscles, which produce these movements, is voluntary or the effect of volition. But, muscles have besides a power of acting independently of the will, and this power is constantly exerted in a tendency to approximate their points of attachment. This, in its natural or ordinary degree, is called the tonic power of the muscles ; but when inordinate it is denominated spasm.

It is not the exertion of the voluntary power that a surgeon has to fear. A man with a broken leg or thigh does not willingly put the muscles of the limb into action, because he is aware that any attempt to move the limb would give him pain ; not only at the moment, but more remotely, by producing derangement in the fractured parts. It is the latter mode of

action, which is increased by mechanical or other stimuli, that a surgeon has to dread in the treatment of fractures. This operates materially in producing shortening of the limb. It has a constant tendency to displace the fragments; and its effects are the more injurious, in proportion to the obliquity of the fracture. The slightest riding of the bones increases its activity. Over it the patient has no control, and the surgeon has too often found it frustrate his best curative intentions.

As the action of the tonic power of the muscles is increased by any thing that irritates their bellies; and, as it is by the action of this power, principally, when no longer resisted by the contact of the bony surfaces, that shortening of the limb is effected, it is evident, that all those causes which tend to produce derangement of the fracture and to separate the fractured surfaces from each other in the transverse direction, should be, if possible, avoided, even if it were for no other reason than to guard against shortening of the limb. But, however attentive the patient may be, he is not able to prevent the derangement of the fragments of a fracture; for when a limb is broken it is no longer under the command of the patient's will; the fracture, therefore, is liable to be displaced by a variety of external causes, the action of which the patient is not able to resist from any power that may be still inherent in the injured limb. Among these causes are the different movements made in the body to answer the calls of nature, inadvertent movements in the limb itself, &c.

From what I have said, it will be seen that the principal causes which produce derangement of a broken bone, are mechanical forces foreign to the injured limb, and which for the most part are purely accidental; and those more important causes arising from the tonic contraction of its muscles.

After a surgeon, therefore, has reduced a fracture, he should turn his attention to the means of guarding the fractured parts against the influence of accidental or intentional changes in the position of the body, and the effects of any impetus given to the limb itself below the site of fracture. He should take care that his means possess the power of resisting the involuntary action of the muscles. He should also consider in what way these indications can be answered with the least possible inconvenience to the patient, and at the same time in such a manner as is calculated to give him every advantage which is likely to insure a proper and speedy union of the bones. Some mechanical contrivance which would enable the surgeon to effect these purposes, has been long a desideratum; any attempt, therefore, however humble, which has for its object this accomplishment, has some claim to the notice of scientific men.

It is not necessary that I should take up the time of the Society by entering into a detailed account of the various splints and machines that have been invented for the treatment of fractures, since it is to be presumed that the ordinary means are the most approved. But these, concerning which I shall say a few words, I may venture to assert, are, in many cases at least, inadequate, even in the hands of the most competent and skilful surgeon; and in all cases uncertain in their effects.

The pieces of deal which are usually called short splints, when used in the treatment of fractures of the thigh, have but little effect in guarding the fractured parts from motion; or in guarding them from being displaced by the motions of the body; or by any accidental impetus given to the limb below the fractured part. This, I think, will appear from the first experiment related in my observations upon fractures of the

lower extremities, and also from the experiments related in my observations upon fractures of the arm. When they are made use of for fractures of the leg, the same observations will apply, though not so forcibly. Besides, there is nothing in the construction to support the heel or sole of the foot, consequently, if the fracture is loose, displacement will take place; and, if the fracture extends into the ankle joint, the bone may unite in such a manner as to produce that permanent extended state of the foot upon the leg, which is usually denominated pointed toe. Again, there is nothing in their construction which is sufficient to prevent the occurrence of eversion of the foot, consequently, we frequently see patients who have been treated with these splints, ever after walk with the inside of the affected foot turned forward. Further, it is generally necessary to keep up extension in the treatment of fractures of the thigh; and frequently in the treatment of fractures of the leg; but there is nothing in the form or mechanism of the short splints which is capable of doing this.

In order to overcome the difficulty which arises from the retraction of muscles, surgeons have adopted what is called the long splint. This is placed along the outer side of the limb, so as to keep up extension between the hip bones and the foot. There are several varieties of the long splint, but all that I have yet had an opportunity of examining, fall far short of answering the indications which present themselves. The inventors, it would seem, have confined themselves to the mere idea of keeping up extension, with but little regard to the form or mechanism of the limb. Hence we perceive that, though any one of them may occasionally answer, they must all, from their very nature, be often insufficient, and frequently injurious. Thus we see that the long straight splint

with a screw, tends, by its action, to keep the fractured surfaces from each other, when used in the treatment of fractures through the neck of the thigh bone ; and, therefore, instead of assisting nature to bring about an union, it tends to prevent it ; and may be often a cause of non-union in fractures that, with more favourable means, may be made to unite. Again ; when used for fractures extending through the lower end of the thigh bone, its tendency is, to leave the patient lame for ever after the cure is effected, from the position in which it causes the bone to unite. Many other evils attending the use of the long splint may be pointed out, equally injurious to the patient ; but those I have mentioned are sufficient to show that it must frequently fail to produce the beneficial effects which the surgeon should have constantly in view. Yet this splint is generally considered the best that has hitherto been used in order to prevent shortening of the limb.

Many of the evils which arise from the use of this splint are produced by the straight position in which it must always confine the limb. Some surgeons are aware of this ; and being fully sensible of the advantages which accrue to the patient from bending the limb, in certain cases, they make use of what is called the fracture box, or the double-inclined plane. Both of these contrivances are constructed upon the same principles ; and the chief difference in them consists in the introduction of a foot board in the fracture box ; but this is made in such a manner that it can have no other beneficial effect than to keep the foot from falling to the inner or outer side, and to support the sole. Both of these apparatuses have some advantages over the short splints, and also over the long splints in some cases ; but even in the treatment of those cases for which they are considered most applicable, their

employment is frequently attended with disadvantages that materially militate against their use.

It may not be improper to state, that the apparatus called the double-inclined plane, consists of a frame and of two pieces of board, fastened together in the middle by a hinge. One end of one of these boards is connected by means of a hinge to one end of the frame of the apparatus; the other board is left unconnected at one end, so that it may be made to form an angle of any degree with the board to which it is attached at the other. When the surgeon has found the angle which he thinks most advisable for his case, he may fix the two planes at that angle upon the frame, by means of a rack placed there for the purpose.

The fracture box and the double-inclined plane are principally used in the treatment of fractures of the thigh; and when either of them is employed in the treatment of these accidents, it is intended that the thigh shall be fixed upon the apparatus. This intention is not answered, because the weight of the trunk causes the bed to yield under the nates; while the wide frame of the fracture box, or of the double-inclined plane, prevents it from sinking in the same proportion. This alteration in the relative position of the body, with respect to the apparatus, is followed by a variety of injurious consequences. If the apparatus is placed so as to support the back of the thigh at all, the upper part of the limb is forced against its corresponding end; and the pressure thus produced, frequently occasions pain, tumefaction, and sometimes abscess, at the upper and back part of the thigh: and if the fracture is high up, the action of the flexor muscles of the thigh, assisted by the pressure of the apparatus, frequently produces displacement of the bone in the transverse direction; and, as soon as this is effected, the muscles, which

bend and extend the leg upon the thigh, being no longer resisted by the contact of the fractured surfaces, act upon that part of the limb which is below the fracture, so as to keep it close upon the apparatus; while the trunk, by its own gravity, sliding towards the foot of the bed, forces down before it that part which is above the fracture. Thus the upper portion of the bone is made to press the lower; which, compared to the upper portion, may be said to be fixed upon the apparatus. The displacement which follows the combined operation of these causes, is too often productive of great and permanent shortening of the limb, great deformity and lameness. The results which daily follow the use of these contrivances, show that they have but little influence in preventing displacement of the broken extremities of the bone. Again; even if no other mischief should occur, when the patient raises the hips to answer the calls of nature, the upper fragment, following the direction of the pelvis, is raised from the apparatus, and motion is produced in the seat of fracture. This motion frequently produces pain, and much retards the cure. Hence it may be seen, that there is little dependance to be placed upon the support which is given to the limb by the fracture box, or the double-inclined plane, in the treatment of fractures of the thigh. Further; it is often necessary to keep up a steady extension when the limb is placed in the bent position; but in what way this can be done by the fracture box or the double-inclined plane, I am ready to confess myself at a loss to determine.

I have now endeavoured to give the Society a general notion of the effects of those means which are usually resorted to in the treatment of fractures of the lower limbs, and also in the treatment of dislocations of the ankle. I might have mentioned many other contrivances which have from time to time

laid claim to notice ; but, as those I have touched upon are the most approved, I may be allowed to pass over the others in silence.

What I have stated respecting those contrivances in common use, will be sufficient to show that some improvement in the treatment of fractures was required.

Strongly impressed with the importance of these accidents, both to the surgeon and to the patient, I was led to contrive an apparatus for the treatment of them, upon principles which to me are new. The principles of this apparatus, and the advantages it gives to the patient, as well as to the surgeon, I shall now attempt to describe.

In my observations upon fractures of the lower extremity, I have endeavoured to show, that, in the treatment of those which occur in the leg and thigh, it is proper to fix the whole limb as far as the hip joint ; and that in certain cases it is advisable to fix the pelvis also. The first of these principles my apparatus is capable of effecting ; and the second it accomplishes by the assistance of a bandage.

By this apparatus the limb can be fixed in such a manner that, if the fracture is not through the neck of the bone, or the trochanters, which are parts contiguous to the neck, it may be made entirely passive to the motions of the apparatus, whenever an impetus is given to it, either above or below the situation of the fracture, and so as to allow of the total motion of the limb in the hip joint ; at the same time that it prevents any motion between its parts.

Hence we see that, when the fracture is through any part of the limb below the upper third of the thigh, any motion given to the pelvis, as in the act of raising it to answer the calls of nature, and in the act by which the patient draws himself up in bed to obtain relief from any uncomfortable

position, motion is given to the instrument; and by it, passively, to the limb; which, however, does not feel it in any particular part, but as a whole, from the hip joint to the very sole of the foot. Again, the limb may be passively rested upon the bone to which it is connected, without producing any motion in the situation of the fracture; and this is the case, whether there exists one fracture or a dozen.

In most fractures of the thigh, when the limb is bent, the power of those muscles, which have the greatest tendency to displace the fragments, is much weakened; but yet, by what is called their tonic power, they are capable in many cases, of acting sufficiently to produce considerable displacement of the fragments. From this we may learn that something is required to resist the acting even of those muscles which are so placed upon the limb as to admit of being greatly weakened by position. In some cases, the straight position is the best for the surgeon to adopt. But whether the fracture be such as would render it most advisable to place the limb in the straight position or in the bent, a steady resistance to the action of the muscles is generally required. Fractures of the leg too, which pass through the bone in an oblique direction, require the application of a steady extending force to prevent shortening of the limb. But this can not be done with any of the ordinary contrivances, with a proper regard to other indications.

The apparatus which I forward for the inspection of the Society, is so contrived, that it admits of being altered in such a manner, that it can be made to act according to the situation or nature of the accident; and, I trust, will be found capable of resisting the action of those causes which are so frequently productive of deformity and lameness.

In order to enable the Society to judge more clearly, how

far my apparatus may be worthy of the notice of the profession and the public, it will be proper for me to enter a little into detail. In doing this, I will briefly relate some cases, by way of illustration ; which I shall choose from among those that have been treated with my apparatus in public hospitals, in preference to those that have occurred in my private practice.

In the treatment of all cases of fracture through the upper third of the thigh, I may say, that the action of this apparatus is more complete than that of any other which I have seen employed.

When used in the treatment of fractures through the neck of the thigh bone, it may be made to keep the injured limb as long as the other, to support the limb in a proper relative position with the bones to which it is naturally connected, to prevent the foot from becoming everted, and to keep the broken ends of the bone closely applied to each other. These effects all tend to the same beneficial result, viz., to assist nature in her efforts to consolidate the bone. They are advantages, which, collectively taken, cannot be obtained by employing any of the ordinary means ; nor in my humble opinion, if it were possible, all of them together. We have only to fix the lower part of the body, and, with my apparatus, every other indication which I have noticed may be fully answered.

But though I should always advise the lower part of the body to be fixed, in such cases, as a precautionary measure, it does not appear that it is essential to do so in every instance, where my apparatus is employed.

When the apparatus is used in the treatment of fractures which extend through the bone just below the parts contiguous to the neck, it admits of being adjusted at any angle the ceas may require. It thus enables the surgeon to weaken the

action of those muscles which tend most to displace the fracture, and, at the same time, by being placed so as to keep up a steady extension, it prevents the limb from becoming shortened although it be fixed in the bent position. It also keeps the fractured surfaces closely and steadily applied to each other, and prevents the foot from becoming everted. It has the advantage too, even in this situation, of enabling the surgeon to relieve his patient, in some measure, from the irksomeness of confinement, by allowing him to have his bed made occasionally, and to have clean linen as often as he wishes. But the advantages which are gained from the use of the apparatus in the treatment of such cases, may be rendered more apparent and more satisfactory by giving an example.

A man, aged 51, fell over a tub and broke his thigh across the upper third.* He was admitted into Guy's hospital, under the care of Mr. Foster, and the usual splints were employed; but he suffered greatly from their use, and they all failed to keep the bones in proper opposition. On the tenth day, the bones over-lapped so as to make the fractured limb from two to three inches shorter than the sound one. There was also an angle formed at the seat of fracture which might be represented by the elbow when the arm is bent. My apparatus was now applied, and was kept upon the limb for a month; when it was taken off, and the bone was found united. The limb which had been fractured, was now of the *same length as the other*, and there was not the least apparent deformity in any way.

His bed was made two days after the apparatus was applied, and this was repeated at the end of a fortnight. The

* From one inch and half to two inches below the trochanter minor.

limb could be rested upon the bone to which it is connected, without giving him pain or disturbing the fracture. He could draw himself up in bed, without experiencing any sensation of motion or of displacement in the injured part.

Fractures of the thigh most commonly occur through the middle third, and I think we may average as many fractures below the middle third as above it ; I will, therefore, assume that four fractures of the thigh out of five, occur below the upper third ; and, I think, I am much within the number. Now, in addition to the advantages above stated, when my apparatus is employed, a patient, with any kind of simple fracture of the thigh through the middle third, may not only have his limb passively moved as often as he wishes, but, in many cases, he may, with common care, turn in bed without retarding the cure, and without any danger of disturbing the fracture.

A man, aged 20, was admitted into St. Thomas's Hospital, with a fracture of the thigh. He had fallen under a waggon containing a load of about two tons ; and the wheel, passing over the thigh, occasioned a fracture across the middle third. Two days after the accident the apparatus was applied ; and he was desired to place the limb either on the heel or on the side, as he felt one or the other of these positions most easy to himself ; and to alter it from one to the other, at pleasure ; and also to have his bed made every other day. This mode of treatment was followed for a month ; and, at the end of this time the bone was united. He now got up with the apparatus on, sat in a chair or walked about the ward with the assistance of crutches. Three days after this the apparatus was taken off ; and, at the end of six weeks from the time of the accident, he was able to walk with the assistance of a stick ;

and, at this time, not the least shortening or deformity could be discovered.*

With respect to the fractures that occur through the lower end of the bone, and which are, by many, considered incurable without great deformity and lameness, I may say, that the apparatus is as capable of producing the same happy results, as in those cases which take place through the middle of the bone. But lest I should be looked upon as tedious, I will leave the consideration of fractures of the thigh, to say a few words relative to its effects in the treatment of those which occur in the leg.

When the apparatus is used in the treatment of simple fractures of the leg, the patient may get up a few days after the accident (the time being regulated by the surgeon), and, with common care and attention, he may walk about with the assistance of crutches, without any danger of deranging the fracture or of producing deformity in the limb.

Some surgeons consider, that a patient with a broken leg should not be allowed to get up so soon; because, in their opinion, the practice would produce great irritation and retard the union of the bones. But both of these objections are purely hypothetical. I may answer the first by inquiring, Why then allow a patient to get up with a fractured arm? And the second, by the following case:

A man, 55 years of age, was admitted into Guy's Hospital, with a fracture of both bones of the leg through the lower

* The time of confining a patient with a fractured thigh to his bed, under the usual treatment, is, generally, from six to eight weeks; and during this period, which is often much prolonged, he is not permitted to alter the position in which he is first placed, or to have the limb moved, except with a view to re-set the fracture when it gets deranged.

third. The fracture of the large bone extended obliquely into the ankle joint. The accident was occasioned by a fall from the step of a carriage. The apparatus was applied ; and the man was up on *the third day* ; and on the fourth from the time of the accident, he began to walk about the ward with crutches. On the twenty-fourth clear day after the accident, the bones were found firmly united ; and at the end of the fifth week, just at the time he might with the common treatment have had his bed made for the first time—he was able to walk across the ward without crutch or stick.

This man got well much within the usual period, without any unpleasant symptom, without deformity or lameness ; and his case, to which many may be added, must be regarded as a proof in favour of the practice of allowing patients to be about before the bones are united.

As a contrast to this, I may give the case of a man, about 30 years of age, who was admitted into St. Thomas's Hospital with a fracture of both bones of the leg. The apparatus was applied on the fifth day from the time of the accident, and he was suffered to lie in bed, in one position, for *eight weeks* ; and, *at the end of this time*, though he remained quiet and had his bed made only once during the eight weeks, *the limb was not united*. He was now allowed to get up with the apparatus on, and walk about with the assistance of crutches ; and, under this treatment, the bone united firmly.

This case occurred in a fine young man, possessing a healthy constitution ; he had no infirmity which tended to retard the union of the bone. It will be recollected that the same apparatus was used in both cases. If we take the ages of these two men into consideration, we shall find that the bones of the latter ought to have united in a shorter period than those of the former ; and, therefore, if no advantage

were gained from allowing the patient to be up, we might have expected the cure to be at least equally speedy in the man confined to bed as in him who was permitted to leave it. Here, then, is a case which proves that when patients are confined to bed, the bones unite much more tardily than when they are allowed to move about, even when such means are made use of as are equally capable of fixing the parts, whether the patient be in bed or not.

I must here be allowed to remark that I do not mean to insinuate, by the above observation, that a man with a fracture of the leg may be permitted to leave his bed before the bones are united, when the limb is guarded by the usual means only; on the contrary, I believe that it is a practice which cannot be followed with impunity. When such means are resorted to as cannot be made to fix the fractured parts, we must of two evils choose the least, and cure the limb at the risk of weakening the constitution; but when the case is of such a nature that the patient may, without danger, be allowed to be about, it will hardly be denied that that practice which effects a cure most speedily, and at the same time saves the patient from confinement, must certainly be the best.

At the time my apparatus was first brought forward, it was considered by some surgeons, that the common splints could be made to confine the limb sufficiently to admit of a patient's leaving his bed without any danger of deformity or of non-union. It has come to my knowledge that this practice has been tried in several cases, one of which I will mention, as a caution to my brethren.

A healthy young man was struck upon the leg, with a force sufficiently powerful to break both bones. He had the common splints applied, and, *three weeks* after the accident, he

was allowed to get up with them *closely* confined upon the limb. He was up for *twelve weeks*, cautiously walking about with the assistance of crutches, carrying the limb in a sling. He now came to St. Thomas's Hospital, as union had not taken place: the day after his admission into the hospital my apparatus was applied, and the man was desired to walk about, with the assistance of crutches, as much as he pleased, taking care to carry the limb in a sling. The apparatus was worn thirty-two days, and at the end of this time the bone was found united.

Here it will be observed, that one mode of practice was followed for twelve weeks, after three weeks confinement in bed, and failed to do what was accomplished by another in thirty-two days; and, therefore, I think we may fairly infer that the cause of non-union in this case is referable to the line of treatment which had been previously adopted.

Not only does the apparatus succeed in the manner above stated in common cases of fracture of the leg and thigh, but in cases where the contrivances usually resorted to have failed to produce union; in proof of which I may state the following case, which occurred in a person well known to fame.

I was called to Mr. Wallack, the actor, in consultation with sir A. Cooper and Mr. Tipple, of Mitcham, in consequence of his being confined with an un-united fracture of the leg. The fracture had existed seven months; during this time he had been treated in the manner usually advised. This gentleman had been under the care of some of the most eminent surgeons in America, Drs. Post, Kissam, and Physic, all of whom are well known in the surgical world, and I mention these names to show that Mr. W. had not been neglected.

Finding the various attempts made to unite the bone unattended by any beneficial result, he came to London for further surgical advice.

The apparatus was applied, and he was desired to take an airing every day, with the assistance of his crutches or in his gig. This he did, and also frequented the public places of amusement. The treatment here mentioned was persevered in for forty days, and at the end of this period the limb was found firmly united, and he is now following his usual avocations in London.*

The method by which this cure was accomplished, for all that I know, is new, and I trust will be found to supersede the painful and too often unsuccessful practice of sawing off the ends of the bone, of applying caustic to them, of introducing setons through the limb, &c.

I have now endeavoured to give the Society a general view of the utility of the apparatus in the treatment of recent simple fractures of the leg and thigh, and also in the treatment of those that have resisted the common means. It yet remains for me to show how far it is applicable in the treatment of compound fractures, and in the treatment of dislocations of the ankle and injuries of the knee.

By the term compound fracture, surgeons mean a solution of continuity in a bone, produced by violence, with a wound leading to the bone at the fractured part. This difference in the nature of the accident, trifling as it may seem, often sufficiently complicates the injury to make it strike at our existence. The untoward symptoms in these cases are greatly

* I have treated six other cases upon the same plan, and all have proved successful.

increased by the riding of the broken ends of the bone, the serrated edges of which prick and lacerate the surrounding textures, and produce pain, spasm, and inflammation in the limb, which too often go on to the death of the part and the destruction of the patient ; and if the inflammation, by the help of a good constitution, should terminate in the formation of matter instead of in mortification, the matter not having a ready exit, burrows amongst the contiguous textures, producing abscess after abscess in distant parts of the limb, and often obliges the patient to submit to amputation in order to save himself from an untimely grave. These exasperated evils, in my humble opinion, ought more frequently to be attributed to the mode of treatment which the common plans oblige the surgeon to adopt, than to the nature of the injury which he has to treat. With them his hands are fettered ; he sees but he cannot act. By the help of the apparatus which the Society have now an opportunity to examine, I may say, from experience, that the surgeon can make use of the most powerful means to prevent or subdue the dangerous symptoms—means which he does not dare employ without the assistance of some such contrivance.

I might bring forward various cases in proof of these assertions, but one will suffice for the purpose of illustration :—

Oct. 19th, 1822. As a woman, aged 39, was riding from London to Croydon, in a cart containing a load of about one ton weight, she fell from it upon the road, at a part which had been recently covered with flint stones. The wheel passed over the leg as it lay upon the stones, and produced a compound comminuted (broken into several pieces) fracture of both bones a little above the ankle joint. She had three wounds on the inner side of the limb, at the seat of fracture, which bled considerably. She was brought to St. Thomas's

hospital in a litter, and on the 11th day after the accident my apparatus was employed. At this time the limb was bent, so as to form an angle projecting forward at the seat of fracture. At the expiration of forty days the apparatus was taken off, and the limb was now straight and firmly united.

During the time she wore the apparatus she had her bed made every second or third day, without pain or inconvenience, and without any sensation of motion in the fracture.

The observations which I have made upon the subject of compound fractures will also apply in the treatment of compound dislocations of the ankle. In these cases the apparatus keeps the foot and leg in a natural position ; it keeps the injured parts steady and in proper opposition, without impeding the circulation. It thus favours a speedy union of the soft parts and of the fracture which always accompanies these accidents ; and, if suppuration should occur, it allows of a ready exit to the matter. It admits of being altered, so that the limb may lie upon it as upon an inclined plane ; it thus enables the surgeon to facilitate the return of the blood to the heart, and to lessen arterial action. It allows the careful surgeon to apply any kind of dressing to the wound, and to remove it at the proper periods, without producing the least motion in the situation of the injury or any alteration in the relative position of the limb. Thus the patient is saved from the pain which would be produced by any movement which may be accidentally or intentionally given to the limb when the wound is dressed, or at any other period, and all its injurious consequences. The patient may have aperients administered, so as to produce free action upon the bowels, as occasion may require ; and he may have the limb moved or have his bed made, as often as may be necessary for his com-

fort, without producing pain or inconvenience, and without disturbing the injured parts.*

After what I have stated respecting the utility of the apparatus in the treatment of compound dislocations of the ankle, I need not say any thing respecting its advantages in the treatment of those which are simple.

In the treatment of injuries of the knee its utility consists in keeping the whole limb quiet, and in preventing the tender surfaces from rubbing upon each other, at the same time that it enables the surgeon to place the limb so as to favour the return of the blood to the heart and impede the action of the arteries.

I might have supported the utility of the apparatus, in the treatment of those accidents for which it was constructed, by the relation of various other cases under each particular head; but as I have been favoured with the concurring testimony of other individuals, further detail would be superfluous.

* I address these observations to the Society at large, but as it is composed of members of various ranks and professions, I fear the beneficial results which must accrue to the patient, from the adoption of a plan which affords these advantages, can only be duly appreciated by the surgeon. The patient finds a difference between a mode of treatment which contributes so much to his comforts, to his ease, and to his safety, and that which confines him to his bed for weeks and months in one position, in all the filth which, notwithstanding the utmost care of the attendants, is necessarily generated by a large suppurating wound, as well as that which, by other circumstances is unavoidably produced; but the surgeon only can estimate how far the advantages I have mentioned tend to preserve the health of the constitution; he only can perceive how far they contribute to the speedy recovery of the subject of an accident of so formidable a nature.

CERTIFICATES.

SIR; Southampton Street, Bloomsbury,
London, April 24, 1823.

HAVING had experience of the great and superior advantages derived from your peculiar instrument for fractures, in the treatment of two cases of fracture of the leg, and one of the thigh, I am happy to give my testimony of its great utility in compound and even in simple fractures of the lower limbs; and should it be of any service to you, it will give pleasure to your humble servant,

T. FORSTER, *Senior Surgeon,*
Mr. Amesbury. Guy's Hospital.

March, 1823.

HAVING witnessed, in my practice at Guy's hospital, considerable advantage derived from the use of an instrument invented by Mr. Amesbury, for the cure of fractures of the lower limbs, I recommended its employment in a case of non-union of the large bone of the leg in Mrs. U. the lady of one of the most respectable of the country gentlemen of Suffolk, and in a similar example in Mr. Wallack, the actor, and with the happiest results. In the former case the bone had not united at the end of eight weeks, and in the latter, seven months had elapsed without union: both patients were cured without confinement, either from exercise or amusement, Mrs. U. in thirty-eight days and Mr. Wallack in forty.

This instrument seems particularly calculated for the cure of cases of non-union, as it admits of being adjusted so as to confine the fractured parts from motion whilst it presses the broken extremities of the bone firmly together, so as to excite ossific action. ASTLEY COOPER.

ASTLEY COOPER,
Surgeon to Guy's Hospital.

14, Bloomsbury Square,
April 24, 1823.

SIR;

I HAVE great pleasure in affording my testimony in favour of your instrument for the treatment of fractures. Although I have casually had an opportunity of seeing the progress of some of those cases which have been treated with it in Guy's hospital, and as far as my observation has gone, have had great reason to think very favourably of the result; yet it is only in the case of Mrs. U. that, from frequent attendance during the whole cure, I am enabled to speak confidently. In the case of that lady, the union of the fractured tibia (large bone of the leg) not having taken place, the limb was rendered in a great degree useless, and her health was beginning to suffer from confinement. By the employment of your instrument, union was brought about without the usual restraints, and her health was much improved during the remainder of her cure, so that I had every reason to think very highly of the treatment adopted, and should certainly recommend it in any similar case.

I am, Sir,

Mr. Amesbury.

&c. &c. &c.

RICHARD BRIGHT.

22, Lincoln's Inn Fields,

Feb. 26th, 1823.

SIR;

I HAVE great pleasure in expressing my approbation of your apparatus for the treatment of fractures of the lower extremity. It has been successfully employed under my immediate inspection, at St. Thomas's Hospital, in one case of fracture through the middle of the thigh bone; in one case of simple fracture of the leg extending transversely through both

bones; in one case of un-united fracture of the leg; in three cases of compound fracture of the leg; and in one case of oblique fracture of the leg, which is still under my care. In all these cases the patients have appeared to derive great advantage from the use of the instrument.

The main purpose in the employment of mechanical contrivances in the treatment of fractures, seems to be that of preventing displacement of the broken extremities of the bone, both from the motions of the body, and from the actions of the muscles of the limb, under all the incidental varieties in fractures of situation, direction, and complication. This indication is, to the best of my judgment, more effectually and more easily fulfilled by your apparatus, and with greater comfort to the patient, than by any other contrivance with which I am acquainted.

I am, Sir,
&c. &c. &c.

JOSEPH HENRY GREEN, *Surgeon to*
Mr. Amesbury. *St. Thomas's Hospital.*

Mr. Green not being able to attend the committee, the evening the apparatus was under examination, politely forwarded to me the following communication.

SIR ; 22, Lincoln's Inn Fields,
May 8th, 1823.

I REGRET that I shall not be able to attend the Society of Arts this evening. I should have been most happy otherwise to give my testimony, personally, to the various advantages gained by using your apparatus in the treatment of fractures of the lower extremities. Indeed I know of no other contrivance, which has, even for its object, the accomplishment

of so many important indications in the treatment of those injuries.

From what I have observed, I may state, that your apparatus fixes the fractured parts with more security than other instruments, in consequence of its preventing motion in the joints influencing the fracture. It allows of alteration in the position of the extremity, a circumstance so necessary under the varying states of these accidents that it is the condition of success in many cases; and it may be placed so as to ensure extension of the leg or thigh, whether the limb be bent or straight, if the case should require it. When used in the treatment of fractures of the thigh below the upper third, or in the treatment of compound fracture of the leg, it permits the patient to evacuate his bowels; and to be moved from his bed, in order to have it made, and, in most cases of simple fracture of the leg, to sit up or walk, with the assistance of crutches, before the bones are united, without the least danger of displacing the fractured extremities; and it admits of being placed upon the limb so as to press the broken ends together when the union is tardy. The instrument is easily adjusted; it may be used in any situation, as it requires no auxiliary means or contrivances and is light and portable; and its mechanism is free from any unnecessary complication. In fact, from the experience which I have had, it appears to me a most valuable aid in our treatment of fractures of the lower extremities, and, as far as I know, original with yourself, at least I do not know of any contrivance which is like it in principle or in mechanism.

I am, Sir,

&c. &c. &c.

JOSEPH HENRY GREEN, *Surgeon to*

Mr. Amesbury.

St. Thomas's Hospital.

P. S. In reply to your question whether it would be safe for a patient to be moved out of bed with the ordinary splints, or box, I can only say, that I do not think that they are a secure support even in bed ; and that, with a cough or in using a bed-pan, I have known patients complain of motion and pain in the fractured part.

J. H. G.

Guy's Hospital,
SIR ; Thursday, March 27, 1823.

IN answer to your note requesting my opinion of your instrument for fractures of the leg and thigh, I can state with great pleasure my full conviction of its utility.

I have seen three cases of simple fracture of the leg treated with it in Guy's Hospital. One a man about 55 years of age, with a fracture of both bones, on whom the apparatus was applied the second day after the accident : a second was a female aged about 45, with tibia and fibula broken just above the ankle joint, in which case the instrument was not applied till the 14th day ; a third, was in a woman, aged 42, with a severe contusion of the ankle, and fracture of both bones, just above the ankle joint. In this case the instrument was applied on the third day. These patients were allowed to get up in three days after the instrument was applied, and the bones were found firmly united in the usual period ; and they left the hospital without any deformity in their limbs.

In a case of fractured thigh, extending through the upper third, now convalescent in Cornelius ward, I have seen the instrument used with great benefit and comfort to the patient. The instrument was applied 31 days ; and during that time

the limb could be freely moved, without displacing the bones or producing pain.

I yesterday saw a patient walking in the square of our hospital, with both bones of the leg broken; and partially dislocated outward, off their articular surfaces. This patient had the instrument applied on the day of the accident, which was only a fortnight ago.

These facts speak more strongly in favour of your invention than any general opinion I could give. Its real merits when known, cannot fail to procure it a favourable and highly-welcome reception among the profession.

I am, Sir,
&c. &c. &c.

C. ASTON KEY, *Assistant-Surgeon,*
Mr. Amesbury. *Guy's Hospital.*

Doctor Alleyne not being able to attend, forwarded the following communication to the Society.

26, Dean-street,
SIR ; May 8th, 1823.

HAVING been honoured with a letter from the Society of Arts, inviting my opinion respecting an apparatus for fractured limbs, submitted to it by Mr. Amesbury, I cannot forego expressing my regret at the impossibility of my attending the Committee this evening, in consequence of a particular engagement at a distant quarter of the town. This alone, I assure you, prevents my coming forward as an advocate for this very valuable and novel instrument. I have seen many contrivances for fractured limbs, both in this and other countries, and without the shadow of doubt, I do believe the one

now before the committee to embrace more points of utility than any other hitherto introduced.

Having observed the insufficiency of the common means, as applied to fractures in warm climates, I am enabled confidently to expect the most favourable results to this branch of surgery, by the adoption of Mr. Amesbury's plan; and, on my return to the West Indies, it shall be my care to introduce it as widely as possible,

I am, Sir,

To A. Aikin, Esq. &c. &c. &c.
Secretary, &c. &c.

JAMES H. ALLEYNE.

The following was received from Doctor Russell, as he was not able to attend the committee in consequence of illness.

SIR;

Dean-street, May 8th, 1823.

I SHOULD have had much gratification, in complying with the desire of the Committee of the Society of Arts, intimated to me in your letter; but am prevented from doing so by indisposition.

Allow me to state, that it is my decided opinion, speaking from ocular demonstration of its efficacy, that Mr. Amesbury's apparatus is better calculated to answer its intended purposes, than any other which I have hitherto seen used with the view of curing fractures. When it is applied, patients say that they feel a degree of ease and general comfort, which they could scarcely have anticipated to be compatible with the character of their accident. This apparatus admits of motion to the patient and to the limb, in all cases of fracture below the upper third of the thigh. In cases of simple fracture of the leg, the patient may not only turn in bed as he pleases, when

this apparatus is used, but he may, with common care, go out of the house before the bones are united, without the slightest apprehension of any unpleasant consequence. The advantages which have been already, perhaps, stated to result from this principle cannot fail to make some impression on reflecting minds. The judicious application of means capable of giving such advantages must beyond all doubt contribute materially to the favourable issue of every case. One fact which strikingly illustrates the utility of this apparatus is its application in cases of disunited* fractures. It sometimes happens, that in consequence of debility, either hereditary or acquired, the fractured ends of bones do not unite. This apparatus keeps the parts so quiet, so compact, and in such close apposition, that by the exercise which the patient is permitted to take, he acquires health, ossific inflammation is set up; and union is perfected.

I am, Sir,

To A. Aikin, Esq.

&c. &c. &c.

Secretary, &c. &c.

JAMES RUSSELL.

From what has been said I hope the Society will be able to form some notion of the beneficial effects which accrue to the profession and the public, from the judicious application of my humble contrivance. I am far from supposing that the apparatus may not be improved, but I have now brought it to a degree of perfection which, I trust, will be found to bear inspection. The success with which its application has been attended enables me to recommend it confidently to my professional brethren; and I would say to them,

If not the first by whom the new are tried,
Be not the last that lay the old aside.

* A term applied to fractures of long standing.

Reference to the Engraving.

Plate XI.—(The same letters refer to the same parts in each figure.) Fig. 1 is a side or edge view of the apparatus, without the straps that secure it to the limbs. The leg-piece C, thigh-piece A, foot-board P, and wooden sole H, should be made of light strong wood.

Fig. 2 is a front view, with the thigh-piece A represented perpendicular.

Fig. 3 is a view of the back part of the thigh-piece A, together with the straps *a a a*, which secure it to the thigh (one end of the straps is represented as broken off, but they ought to be of sufficient length to go round the thigh), and also the pelvis-strap *b b*, with its sliding-pad *c c*.

Fig. 3a is an edge or side, and

Fig. 4, a front view of the thigh-piece A without the straps.

The front of the thigh-piece A is made hollow to fit the under part of the thigh, and the upper end of the back part is made cylindrical, and the lower end flat. See fig. 5, which is a cross section at the dotted line *dd*, fig. 3; and fig. 6 is a section at the dotted line *ff*, fig. 3. To the upper end of the thigh-piece A is fixed a brass plate B, by means of two screws *g g*, which pass through two holes in the plate B, and through two longitudinal grooves in the thigh-piece A, and also through two holes in the steel plates *h h*, which are opposite to those in the brass plate B, and are fixed by the thumb-screws or nuts, *g g*, in any required situation; consequently the length of the thigh-piece A may be adjusted by means of the screws sliding along the grooves. The front side of the brass plate B is also made hollow to fit the back part of the thigh.

Fig. 7 is a view of the lower end or edge of the plate B.

To the upper end, and on the back part of the plate B are fixed the two steel plates *h h*.

Fig. 8 is a view of the back part of the brass plate B, and of the steel plates *h h*, and fig. 9 is an edge or side view of the same ; they are knee'd or bent to receive between them the thigh-piece A, the pelvis-strap *b b*, and the brass-plate B.

To the back part of the thigh-piece A is fixed a brass rack or plate *i i*, fig. 3, with six projecting pieces, *j j*, and one on the back part of it which receive a brass foot, or transferable joint-piece *k*.

The lower end of the thigh-piece A is connected to the upper end of the leg-piece C, by means of a hinge joint, *l*. (See figs. 1 and 2.) The axis of the joint *l*, which is fixed to the lower part of the thigh-piece A is oblique to a line down the middle of the thigh-piece. By referring to fig. 1, it will be seen that the thigh-piece A is not in a direct line with that of the leg-piece C, but is inclined towards the left hand. This thigh-piece A is adapted to the left thigh. By referring to fig. 4 it will be seen that the bottom of the thigh-piece A, to which the joint *l* is fixed, is oblique in the contrary direction to that of figs. 2 and 3, and when connected to the joint of the leg-piece C by the pin *m*, it will be inclined in a proper direction for the right thigh and leg. Two of these pieces, one for the right and the other for the left thigh are adapted to one set of apparatus. The front of the leg-piece C is made hollow so as to fit the back part of the leg.

Fig. 10 is a view of the upper end of the leg-piece C, its hinge, and one of its straps, *n*, &c.

Fig. 11 is a cross section (at the dotted line *o*, fig. 13) of the leg-piece C, and also one of its straps *n*, which are fixed to it by a brass stud *p*.

Fig. 12 is a view of the lower end of the leg-piece C. The

dotted line at *q*, fig. 1, represents the thickness of the middle of the back part of the leg-piece. From the upper end, to *r*, the back part of the leg-piece is cylindrical, and from *r* to the lower end, it is flat (see fig. 13). To the back part of the leg-piece *C*, are screwed four brass studs, *p p p p*, which pass through the straps *n n*, and retain them in their proper places. The straps are for securing the leg-piece *C* to the leg.

To the back part of the leg-piece *C* is fixed a piece of brass *S*, to which the lower end of a steel rod *t*, is connected by a hinge joint. The upper end of the steel rod *t*, is also connected by a hinge joint *u*, to the foot or transferable joint piece *k* (see figs. 14 and 15, which are a back and edge view of the brass foot or transferable joint piece, rod and spring bolt connected; and drawn to a scale double the size of that of the rest of the figures). The foot *k* is made with a gap in each end, and a hole *v* in the middle, which receives one projecting tooth, while the gaps receive portions of two others. The teeth *j j*, are arranged upon a rack *i*, and are all equally distant, and similar to each other; so that the brass foot *k*, may be applied to any of them, and secured by a spring bolt *w*, which passes through a hole in the side of the foot *k*, and also through a hole in the tooth *j*, which is in the hole *v*, in the middle of the foot *k*. The spring bolt *w*, is made something similar to the key of a flute, and is fixed by a joint to the side of the foot *k*, so that when the end *x* of the key is depressed, it withdraws the bolt *w*, which is connected to the other end of it by a joint, but when the end *x* of the key is not depressed, a spring which is fixed to the under side, raises the end *x*, and thrusts home the bolt *w*. When the hole *v* in the foot-piece *k*, is applied to the lowest tooth *j*, of the rack *i*, the steel rod *t* directs and retains the thigh-piece *A*, perpendicular or straight with the leg-piece *C*; but when the foot-

piece *k* is applied to the highest tooth *j* of the rack *i*, the thigh-piece *A* will be bent to a right angle with the leg-piece *C*, consequently the thigh-piece may be fixed at six different angles, as circumstances may require.

P, fig. 13, refers to the foot-board which clips the lower part of the leg-piece *C*, and is retained by a pin *y*, which passes through a hole in the end of the foot-board where it clips the leg-piece; and also through the leg-piece *C*. In the lower part of the leg-piece are made a number of holes, so that the height of the foot-board *P*, may be accommodated to legs of different lengths. The toe end of the foot-board *P*, must not be admitted to rise more than to form a right angle with the leg-piece *C*; but it may be admitted to turn below that angle. The foot-board is supported by a strap *z*, one end of which receives a brass eye or hook *E*, which is fixed to one edge of the bottom part of the thigh-piece *A*; the other end of the strap *z* is passed beneath the foot-board, and brought up by the side of the leg, and buckled to another strap which also receives a brass eye or hook *F*, on the opposite edge of the thigh-piece, fig. 2. By this contrivance the strap may be connected with either thigh-piece, and may also be accommodated to the length of the leg. To the under side of the foot-board is nailed a piece of leather *G*, fig. 16, which passes beneath the strap *z*, and prevents it from sliding too near the heel or toe of the foot-board. See fig. 16, which is a view of the underside of the foot-board *P*.

Fig. 17 is an edge or side view of the foot-board *P*, and of the wooden sole *H* to which the shoe *K* (fig. 1), is nailed.

Fig. 18 is a view of the underside of the wooden sole *H*. On the underside of the sole *H*, is made a recess to receive a strap *I*; one end of this strap is nailed to the sole; the other passes over a gap in the end of the foot-board, and is buckled to a strap *J*, fig. 16, one end of which is nailed to the under

side of the foot-board. The use of the strap I, is to regulate the elevation of the shoe upon the foot-board as circumstances may require. On the upper side of the wooden sole H, is fixed a buckle and strap L L, which passes over the sides of the foot-board, and is buckled beneath it. The use of this strap is to prevent the shoe from slipping off to either side of the foot-board, and to regulate the extension of the limb when necessary. The shoe K is made of sheep skin or soft leather, and opens from heel to toe, so that the foot may be placed in it, without twisting in any direction ; the upper leather of the shoe K is made to fold over the upper part of the foot, and is tied with three ribbons. A small leather strap is stitched to each side of the heel of the shoe, and is brought over the instep and buckled. In fig. 1 is represented a side view, and in fig. 2, a front view of the shoe.

Fig. 19 is a view of the outside of a splint, which is to be applied to the outside of the left leg.

Fig. 20 is a back or edge view, and

Fig. 21 a longitudinal section of the same.

The dotted segments in fig. 19, represent cross sections, or the thickness of the splint at their respective places. M M is a piece of leather fixed to the splint at both ends and at the middle, for the straps to pass under.

The inside of the splint is made hollow to fit the outside of the leg and ankle, and the outside of the splint is made cylindrical or is reduced to a proper strength (See the sections at the dotted lines).

Fig. 22 is a view of the outside of a splint that is to be applied to the inside of the left leg.

Fig. 23 is a front or edge view, and

Fig. 24 is a longitudinal section of the same.

The dotted segments in Fig. 22, represent cross sections on

the thickness of the splint at their respective places, the inside is made hollow to fit the inner side of the leg, and is reduced on the outside to a proper strength.

Fig. 25 is a view of the outside of a splint that is to be applied to the front of the leg, and

Fig. 26 is an edge view of the same, showing the manner it is bent. This splint consists of four thin pieces of light wood, one of which is equal in width to the other three. The inner side of the splint has a piece of thin leather glued over it, and the outer side has two pieces of leather N N stitched across it; so that the inner side of the splint may be bent to fit the front of the leg. It has a long narrow piece of leather O stitched at four places to the outside, for the straps to pass under.

Fig. 27 is a view of the outside of a splint that is to be applied to the outside of the thigh, and

Fig. 28 is an edge view of the same.

Fig. 29 is a view of the outside of a splint that is to be applied to the front part of the thigh.

Fig. 30 is an edge view of the same.

Fig. 31 is a view of the outside of a splint that is to be applied to the inner side of the thigh, and

Fig. 32 is an edge view of the same.

The dotted segments shown in figures 27, 29, and 31, represent cross sections, or the sections of the splint at their respective places; each of these splints has a strip of leather stitched upon it for straps to pass under, similar to those already described. The splints are best made of light deal.

The splints represented in figures 19, 22, and 25, are used, with the apparatus, in the treatment of fractures of the leg; and those which are represented, in figures 27, 29, and 31, are employed, with the apparatus, in the treatment of fractures of the thigh.

The brass plate, represented in fig. 8, is used when the apparatus is employed in the treatment of fractures of the thigh, compound fractures of the leg, compound dislocations of the ankle, and injuries of the knee; but is not required in the treatment of simple fractures of the leg, or in simple dislocations of the ankle.

The pelvis strap, seen in fig. 3, *b b*, with its sliding pad *c c*, is employed in the treatment of all those cases which require the use of the sliding brass plate (fig. 8), and serves to connect the apparatus to the pelvis.

The surgeon having padded the apparatus, regulates its application; and also the application of the short splints, according to the situation and nature of the injury.

N^o VI.

CAP FOR FRACTURED OR DISLOCATED PATELLA.

The SILVER VULCAN MEDAL and TEN GUINEAS were this Session presented to Mr. W. RAYNES, of Regent Street, Westminster, for his CAP FOR FRACTURED OR DISLOCATED PATELLA, which has been placed in the Society's Repository.

WHEN the patella is broken across, the fractured portions recede, in consequence of the contractile action of the powerful ligaments to which this bone is attached. The intention

E R R A T A.

Page 159, line 19, after "piece," add Fig. 5 is a side view of the cross scale and slide.

— 166, — 2 *from bottom, for "92196," read ,92196.*

— 167, — 11, *for "112," read ,112.*

— 182, — 2 *from bottom, after "i i i i," add figures 11 and 14.*

— 186, — 19, *for "treaddle," read headdle.*

— — — 20, *for "treaddles," read headdles.*

— — — 22, *for "treaddles," read headdles.*

— 196, — 19, *after "of larger size," add and by reason of the increased number of cords.*

— — — 28 to 33, "The common," *to "per week," omit.*

— 213, — 5 *from bottom, for "fig. 2," read fig. 1.*

— 226, — 5 *from bottom, for "x y z," read w x y.*

IN THE ANALYTICAL INDEX.

Page 11, between "Gun-powder mills," and "Haggitt Fr.," insert Hack, Mr. T., an universal chuck for Turners, xxxvii, 87.

— 20, *before "Mr. Collinson Hall," insert Mr. T. Hack, for an universal chuck for Turners, xxxvii, 87.*

— 25, *at the end of the article "Millstones of Tuscany," add see also Corn-mills.*

— 45, *before "Turnip-sower," insert by Mr. T. Hack, xxxvii, 87.*

VOLUME XLI.

Page 128, line 15, for "this," read their.

— 129, — 3, *for "observations," read objections.*

— — — 5, *for "the," read their.*

— 132, — 7, *for "press," read pass.*

— — — 29, *for "effects," read imperfections.*

— 133, — 13, *for "extremity," read extremities.*

E R R A T A.

Page 134, line 4, for "rested," read rolled.

— — — 14, *for "acting," read action.*

— 136, — 18, *for "opposition," read apposition.*

— 137, — 1, *for "rested," read rolled.*

— 140, — 10, *for "observation," read observations.*

— 141, — 30, *for "these," read their.*

— 144, — 13, *for "opposition," read apposition.*

— 155, — 6, *cancel "and the brass plate B."*

— 178, — 3 *from bottom, for "Hawes," read Howes.*

— 230 (*note*) *last line, for "§ 28," read § 29.*

— 298, *before "Henry Goodwyn," insert,*

T. GILL.

Technical Repository for 1823, 8vo.